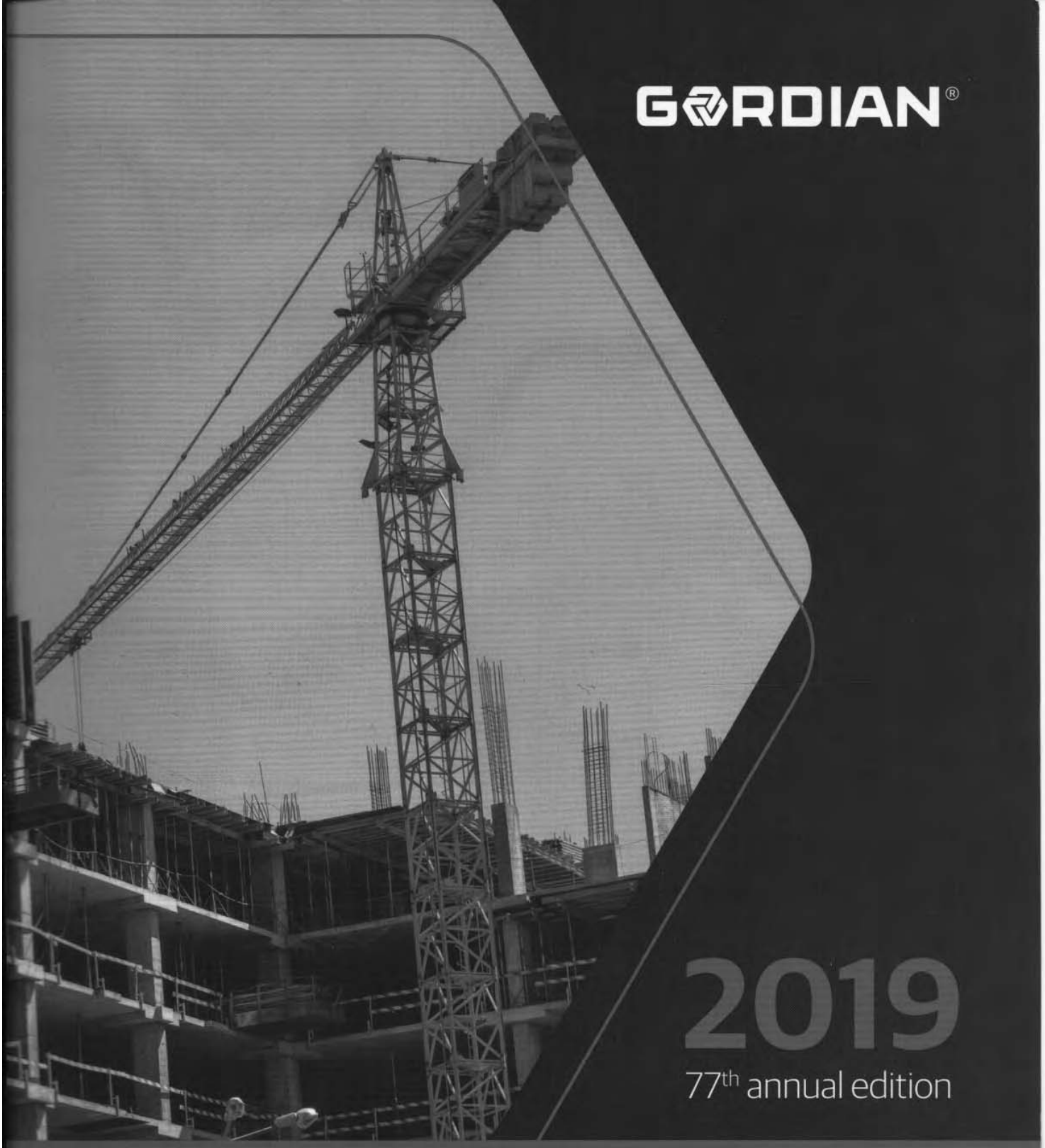

GORDIAN®

2019

77th annual edition

Building Construction Costs
with RSMeans data

Estimating Tips

The labor adjustment factors listed in Subdivision 22 01 02.20 also apply to Division 23.

23 10 00 Facility Fuel Systems

- The prices in this subdivision for above- and below-ground storage tanks do not include foundations or hold-down slabs, unless noted. The estimator should refer to Divisions 3 and 31 for foundation system pricing. In addition to the foundations, required tank accessories, such as tank gauges, leak detection devices, and additional manholes and piping, must be added to the tank prices.

23 50 00 Central Heating Equipment

- When estimating the cost of an HVAC system, check to see who is responsible for providing and installing the temperature control system. It is possible to overlook controls, assuming that they would be included in the electrical estimate.
- When looking up a boiler, be careful on specified capacity. Some manufacturers rate their products on output while others use input.
- Include HVAC insulation for pipe, boiler, and duct (wrap and liner).
- Be careful when looking up mechanical items to get the correct pressure rating and connection type (thread, weld, flange).

23 70 00 Central HVAC Equipment

- Combination heating and cooling units are sized by the air conditioning requirements. (See Reference No. R236000-20 for the preliminary sizing guide.)
- A ton of air conditioning is nominally 400 CFM.
- Rectangular duct is taken off by the linear foot for each size, but its cost is usually estimated by the pound. Remember that SMACNA standards now base duct on internal pressure.
- Prefabricated duct is estimated and purchased like pipe: straight sections and fittings.
- Note that cranes or other lifting equipment are not included on any lines in Division 23. For example, if a crane is required to lift a heavy piece of pipe into place high above a gym floor, or to put a rooftop unit on the roof of a four-story building, etc., it must be added. Due to the potential for extreme variation—from nothing additional required to a major crane or helicopter—we feel that including a nominal amount for "lifting contingency" would be useless and detract from the accuracy of the estimate. When using equipment rental cost data from RSMeans, do not forget to include the cost of the operator(s).

Reference Numbers

Reference numbers are shown at the beginning of some major classifications. These numbers refer to related items in the Reference Section. The reference information may be an estimating procedure, an alternate pricing method, or technical information.

Note: Not all subdivisions listed here necessarily appear. ■

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Note: Trade Service, in part, has been used as a reference source for some of the material prices used in Division 23.

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23 05 Common Work Results for HVAC

23 05 93 – Testing, Adjusting, and Balancing for HVAC

	23 05 93.10 Balancing, Air	Crew	Daily Output	Labor-Hours	Unit	2019 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
2100	Built-up low pressure unit				Ea.				840	840
2200	Built-up high pressure unit								980	980
2500	Multi-zone A.C. and heating unit								630	630
2600	For each zone over one, add								140	140
2700	Package A.C. unit								350	350
2800	Rooftop heating and cooling unit								490	490
3000	Supply, return, exhaust, registers & diffusers, avg. height ceiling								84	84
3100	High ceiling								126	126
3200	Floor height								70	70

	23 05 93.20 Balancing, Water									
0010	**BALANCING, WATER** (Subcontractor's quote incl. material and labor)									
0050	Air cooled condenser				Ea.				256	256
0080	Boiler								515	515
0100	Cabinet unit heater								88	88
0200	Chiller								620	620
0300	Convector								73	73
0500	Cooling tower								475	475
0600	Fan coil unit, unit ventilator								132	132
0700	Fin tube and radiant panels								146	146
0800	Main and duct re-heat coils								135	135
0810	Heat exchanger								135	135
1000	Pumps								320	320
1100	Unit heater								102	102

23 07 HVAC Insulation

23 07 13 – Duct Insulation

	23 07 13.10 Duct Thermal Insulation									
0010	**DUCT THERMAL INSULATION**									
0110	Insulation req'd. is based on the surface size/area to be covered									
3000	Ductwork									
3020	Blanket type, fiberglass, flexible									
3030	Fire rated for grease and hazardous exhaust ducts									
3060	1-1/2" thick	Q-14	84	.190	S.F.	4.62	9.85		14.47	20.50
3090	Fire rated for plenums									
3100	1/2" x 24" x 25'	Q-14	1.94	8.247	Roll	172	425		597	845
3110	1/2" x 24" x 25'		98	.163	S.F.	3.43	8.45		11.88	16.75
3120	1/2" x 48" x 25'		1.04	15.385	Roll	340	795		1,135	1,600
3126	1/2" x 48" x 25'		104	.154	S.F.	3.39	7.95		11.34	16
3140	FSK vapor barrier wrap, .75 lb. density									
3160	1" thick G	Q-14	350	.046	S.F.	.23	2.36		2.59	3.89
3170	1-1/2" thick G		320	.050		.27	2.58		2.85	4.29
3180	2" thick G		300	.053		.32	2.75		3.07	4.60
3190	3" thick G		260	.062		.47	3.18		3.65	5.40
3200	4" thick G		242	.066		.67	3.41		4.08	6
3210	Vinyl jacket, same as FSK									
3280	Unfaced, 1 lb. density									
3310	1" thick G	Q-14	360	.044	S.F.	.25	2.29		2.54	3.82
3320	1-1/2" thick G		330	.048		.40	2.50		2.90	4.30
3330	2" thick G		310	.052		.45	2.66		3.11	4.61
3400	FSK facing, 1 lb. density									
3420	1-1/2" thick G	Q-14	310	.052	S.F.	.38	2.66		3.04	4.53

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23 07 HVAC Insulation

23 07 13 – Duct Insulation

	23 07 13.10 Duct Thermal Insulation		Crew	Daily Output	Labor-Hours	Unit	2019 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
3430	2" thick	G	Q-14	300	.053	S.F.	.44	2.75		3.19	4.73
3450	FSK facing, 1.5 lb. density										
3470	1-1/2" thick	G	Q-14	300	.053	S.F.	.46	2.75		3.21	4.76
3480	2" thick	G	"	290	.055	"	.57	2.85		3.42	5.05
3795	Finishes										
3800	Stainless steel woven mesh		Q-14	100	.160	S.F.	.95	8.25		9.20	13.80
3810	For .010" stainless steel, add			160	.100		3.32	5.15		8.47	11.60
3820	18 oz. fiberglass cloth, pasted on			170	.094		.86	4.86		5.72	8.45
3900	8 oz. canvas, pasted on			180	.089		.27	4.59		4.86	7.40
3940	For .016" aluminum jacket, add			200	.080		1.06	4.13		5.19	7.55
7878	Contact cement, quart can					Ea.	13.05			13.05	14.40

23 07 16 – HVAC Equipment Insulation

23 07 16.10 HVAC Equipment Thermal Insulation

0010	**HVAC EQUIPMENT THERMAL INSULATION**										
0110	Insulation req'd. is based on the surface size/area to be covered										
1000	Boiler, 1-1/2" calcium silicate only	G	Q-14	110	.145	S.F.	4.02	7.50		11.52	16
1020	Plus 2" fiberglass	G	"	80	.200	"	5.55	10.35		15.90	22
2000	Breeching, 2" calcium silicate										
2020	Rectangular	G	Q-14	42	.381	S.F.	7.75	19.65		27.40	39
2040	Round	G	"	38.70	.413	"	8.05	21.50		29.55	42

23 09 Instrumentation and Control for HVAC

23 09 33 – Electric and Electronic Control System for HVAC

23 09 33.10 Electronic Control Systems

0010	**ELECTRONIC CONTROL SYSTEMS**										
0020	For electronic costs, add to Section 23 09 43.10					Ea.				15%	15%

23 09 43 – Pneumatic Control System for HVAC

23 09 43.10 Pneumatic Control Systems

0010	**PNEUMATIC CONTROL SYSTEMS**										
0011	Including a nominal 50' of tubing. Add control panelboard if req'd.										
0100	Heating and ventilating, split system										
0200	Mixed air control, economizer cycle, panel readout, tubing										
0220	Up to 10 tons	G	Q-19	.68	35.294	Ea.	4,500	2,050		6,550	8,050
0240	For 10 to 20 tons	G		.63	37.915		4,775	2,225		7,000	8,575
0260	For over 20 tons	G		.58	41.096		5,175	2,400		7,575	9,275
0300	Heating coil, hot water, 3 way valve,										
0320	Freezestat, limit control on discharge, readout		Q-5	.69	23.088	Ea.	3,350	1,325		4,675	5,675
0500	Cooling coil, chilled water, room										
0520	Thermostat, 3 way valve		Q-5	2	8	Ea.	1,500	460		1,960	2,350
0600	Cooling tower, fan cycle, damper control,										
0620	Control system including water readout in/out at panel		Q-19	.67	35.821	Ea.	5,925	2,100		8,025	9,650
1000	Unit ventilator, day/night operation,										
1100	freezestat, ASHRAE, cycle 2		Q-19	.91	26.374	Ea.	3,275	1,550		4,825	5,925
2000	Compensated hot water from boiler, valve control,										
2100	readout and reset at panel, up to 60 GPM		Q-19	.55	43.956	Ea.	6,075	2,575		8,650	10,500
2120	For 120 GPM			.51	47.059		6,575	2,750		9,325	11,400
2140	For 240 GPM			.49	49.180		6,800	2,875		9,675	11,800
3000	Boiler room combustion air, damper to 5 S.F., controls			1.37	17.582		2,975	1,025		4,000	4,775
3500	Fan coil, heating and cooling valves, 4 pipe control system			3	8		1,325	465		1,790	2,150
3600	Heat exchanger system controls			.86	27.907		2,875	1,625		4,500	5,625

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	23 31 13.13 Rectangular Metal Ducts	Crew	Daily Output	Labor-Hours	Unit	2019 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**RECTANGULAR METAL DUCTS**									
0020	Fabricated rectangular, includes fittings, joints, supports,									
0021	allowance for flexible connections and field sketches.									
0030	Does not include "as-built dwgs." or insulation.									
0031	NOTE: Fabrication and installation are combined									
0040	as LABOR cost. Approx. 25% fittings assumed.									
0042	Fabrication/Inst. is to commercial quality standards									
0043	(SMACNA or equiv.) for structure, sealing, leak testing, etc.									
0050	Add to labor for elevated installation									
0051	of fabricated ductwork									
0052	10' to 15' high						6%			
0053	15' to 20' high						12%			
0054	20' to 25' high						15%			
0055	25' to 30' high						21%			
0056	30' to 35' high						24%			
0057	35' to 40' high						30%			
0058	Over 40' high						33%			
0072	For duct insulation see Line 23 07 13.10 3000									
0100	Aluminum, alloy 3003-H14, under 100 lb.	Q-10	75	.320	Lb.	3.20	18.20		21.40	31
0110	100 to 500 lb.		80	.300		1.89	17.05		18.94	28
0120	500 to 1,000 lb.		95	.253		1.82	14.35		16.17	24
0140	1,000 to 2,000 lb.		120	.200		1.78	11.40		13.18	19.25
0150	2,000 to 5,000 lb.		130	.185		1.78	10.50		12.28	17.90
0160	Over 5,000 lb.		145	.166		1.78	9.40		11.18	16.25
0500	Galvanized steel, under 200 lb.		235	.102		.57	5.80		6.37	9.45
0520	200 to 500 lb.		245	.098		.58	5.55		6.13	9.10
0540	500 to 1,000 lb.		255	.094		.56	5.35		5.91	8.75
0560	1,000 to 2,000 lb.		265	.091		.57	5.15		5.72	8.45
0570	2,000 to 5,000 lb.		275	.087		.56	4.96		5.52	8.15
0580	Over 5,000 lb.		285	.084		.57	4.79		5.36	7.90
1000	Stainless steel, type 304, under 100 lb.		165	.145		4.71	8.25		12.96	17.75
1020	100 to 500 lb.		175	.137		3.83	7.80		11.63	16.05
1030	500 to 1,000 lb.		190	.126		2.62	7.20		9.82	13.80
1040	1,000 to 2,000 lb.		200	.120		2.30	6.85		9.15	12.90
1050	2,000 to 5,000 lb.		225	.107		2.16	6.05		8.21	11.60
1060	Over 5,000 lb.		235	.102		2.51	5.80		8.31	11.55
1100	For medium pressure ductwork, add						15%			
1200	For high pressure ductwork, add						40%			
1210	For welded ductwork, add						85%			
1220	For 30% fittings, add						11%			
1224	For 40% fittings, add						34%			
1228	For 50% fittings, add						56%			
1232	For 60% fittings, add						79%			
1236	For 70% fittings, add						101%			
1240	For 80% fittings, add						124%			
1244	For 90% fittings, add						147%			
1248	For 100% fittings, add						169%			
1252	Note: Fittings add includes time for detailing and installation.									

	23 31 13.19 Metal Duct Fittings									
0010	**METAL DUCT FITTINGS**									
2000	Fabrics for flexible connections, with metal edge	1 Shee	100	.080	L.F.	3.92	4.88		8.80	11.70
2100	Without metal edge	"	160	.050	"	3.51	3.05		6.56	8.50

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23 31 HVAC Ducts and Casings

23 31 16 – Nonmetal Ducts

23 31 16.13 Fibrous-Glass Ducts

		Crew	Daily Output	Labor-Hours	Unit	2019 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**FIBROUS-GLASS DUCTS**									
3490	Rigid fiberglass duct board, foil reinf. kraft facing									
3500	Rectangular, 1" thick, alum. faced, (FRK), std. weight	Q-10	350	.069	SF Surf	.90	3.90		4.80	6.90

23 31 16.22 Duct Board

0010	**DUCT BOARD**									
3800	Rigid, resin bonded fibrous glass, FSK									
3810	Temperature, bacteria and fungi resistant									
3820	1" thick	Q-14	150	.107	S.F.	1.63	5.50		7.13	10.30
3830	1-1/2" thick		130	.123		2.15	6.35		8.50	12.15
3840	2" thick		120	.133		3.71	6.90		10.61	14.75

23 33 Air Duct Accessories

23 33 13 – Dampers

23 33 13.13 Volume-Control Dampers

0010	**VOLUME-CONTROL DAMPERS**									
5990	Multi-blade dampers, opposed blade, 8" x 6"	1 Shee	24	.333	Ea.	32.50	20.50		53	66.50
5994	8" x 8"		22	.364		33	22		55	70
5996	10" x 10"		21	.381		36	23		59	75
6000	12" x 12"		21	.381		45	23		68	85
6020	12" x 18"		18	.444		60.50	27		87.50	108
6030	14" x 10"		20	.400		44	24.50		68.50	85.50
6031	14" x 14"		17	.471		47.50	28.50		76	95.50
6033	16" x 12"		17	.471		47.50	28.50		76	95.50
6035	16" x 16"		16	.500		59	30.50		89.50	112
6037	18" x 16"		15	.533		74	32.50		106.50	131
6038	18" x 18"		15	.533		78	32.50		110.50	136
6070	20" x 16"		14	.571		78	35		113	139
6072	20" x 20"		13	.615		84.50	37.50		122	150
6074	22" x 18"		14	.571		84.50	35		119.50	146
6076	24" x 16"		11	.727		92.50	44.50		137	170
6078	24" x 20"		8	1		113	61		174	217
6080	24" x 24"		8	1		122	61		183	228
6110	26" x 26"		6	1.333		143	81.50		224.50	280
6133	30" x 30"	Q-9	6.60	2.424		212	133		345	435
6135	32" x 32"		6.40	2.500		229	137		366	460
6180	48" x 36"		5.60	2.857		375	157		532	655
8000	Multi-blade dampers, parallel blade									
8100	8" x 8"	1 Shee	24	.333	Ea.	116	20.50		136.50	159
8140	16" x 10"		20	.400		147	24.50		171.50	199
8200	24" x 16"		11	.727		191	44.50		235.50	278
8260	30" x 18"		7	1.143		264	69.50		333.50	395

23 33 13.16 Fire Dampers

0010	**FIRE DAMPERS**									
3000	Fire damper, curtain type, 1-1/2 hr. rated, vertical, 6" x 6"	1 Shee	24	.333	Ea.	34.50	20.50		55	69
3020	8" x 6"		22	.364		34.50	22		56.50	71.50
3240	16" x 14"		18	.444		62.50	27		89.50	110
3400	24" x 20"		8	1		60	61		121	159

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	23 37 13.10 Diffusers	Crew	Daily Output	Labor-Hours	Unit	2019 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**DIFFUSERS**, Aluminum, opposed blade damper unless noted									
0100	Ceiling, linear, also for sidewall									
0500	Perforated, 24" x 24" lay-in panel size, 6" x 6"	1 Shee	16	.500	Ea.	165	30.50		195.50	228
0520	8" x 8"		15	.533		173	32.50		205.50	240
0530	9" x 9"		14	.571		176	35		211	246
0540	10" x 10"		14	.571		176	35		211	247
0560	12" x 12"		12	.667		183	40.50		223.50	264
0590	16" x 16"		11	.727		205	44.50		249.50	294
0600	18" x 18"		10	.800		220	49		269	315
0610	20" x 20"		10	.800		237	49		286	335
0620	24" x 24"		9	.889		260	54		314	370
1000	Rectangular, 1 to 4 way blow, 6" x 6"		16	.500		43	30.50		73.50	93.50
1010	8" x 8"		15	.533		61	32.50		93.50	117
1014	9" x 9"		15	.533		53.50	32.50		86	108
1016	10" x 10"		15	.533		83	32.50		115.50	141
1020	12" x 6"		15	.533		75	32.50		107.50	132
1040	12" x 9"		14	.571		79.50	35		114.50	141
1060	12" x 12"		12	.667		74.50	40.50		115	143
1070	14" x 6"		13	.615		81.50	37.50		119	147
1074	14" x 14"		12	.667		133	40.50		173.50	209
1150	18" x 18"		9	.889		117	54		171	212
1160	21" x 21"		8	1		225	61		286	340
1170	24" x 12"		10	.800		171	49		220	263
1500	Round, butterfly damper, steel, diffuser size, 6" diameter		18	.444		12.55	27		39.55	55
1520	8" diameter		16	.500		13.25	30.50		43.75	61
1540	10" diameter		14	.571		17.20	35		52.20	72
1560	12" diameter		12	.667		22.50	40.50		63	86.50
1580	14" diameter		10	.800		28.50	49		77.50	105
2000	T-bar mounting, 24" x 24" lay-in frame, 6" x 6"		16	.500		72.50	30.50		103	126
2020	8" x 8"		14	.571		72	35		107	133
2040	12" x 12"		12	.667		88.50	40.50		129	159
2060	16" x 16"		11	.727		115	44.50		159.50	194
2080	18" x 18"		10	.800		121	49		170	207
6000	For steel diffusers instead of aluminum, deduct					10%				

	23 37 13.30 Grilles									
0010	**GRILLES**									
0020	Aluminum, unless noted otherwise									
1000	Air return, steel, 6" x 6"	1 Shee	26	.308	Ea.	21	18.75		39.75	51.50
1020	10" x 6"		24	.333		21	20.50		41.50	54
1080	16" x 8"		22	.364		28.50	22		50.50	65
1100	12" x 12"		22	.364		28	22		50	64.50
1120	24" x 12"		18	.444		37.50	27		64.50	82.50
1220	24" x 18"		16	.500		48	30.50		78.50	99
1280	36" x 24"		14	.571		82	35		117	143
3000	Filter grille with filter, 12" x 12"		24	.333		55.50	20.50		76	92
3020	18" x 12"		20	.400		74.50	24.50		99	119
3040	24" x 18"		18	.444		89	27		116	139
3060	24" x 24"		16	.500		105	30.50		135.50	163
6000	For steel grilles instead of aluminum in above, deduct					10%				

23 37 Air Outlets and Inlets

23 37 13 – Diffusers, Registers, and Grilles

23 37 13.60 Registers	Crew	Daily Output	Labor-Hours	Unit	2019 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010 **REGISTERS**									
0980 Air supply									
1000 Ceiling/wall, O.B. damper, anodized aluminum									
1010 One or two way deflection, adj. curved face bars									
1020 8" x 4"	1 Shee	26	.308	Ea.	28	18.75		46.75	59
1120 12" x 12"		18	.444		34.50	27		61.50	79
1240 20" x 6"		18	.444		28.50	27		55.50	72
1340 24" x 8"		13	.615		56.50	37.50		94	119
1350 24" x 18"	▼	12	.667	▼	101	40.50		141.50	173
2700 Above registers in steel instead of aluminum, deduct					10%				
4000 Floor, toe operated damper, enameled steel									
4020 4" x 8"	1 Shee	32	.250	Ea.	13.60	15.25		28.85	38
4100 8" x 10"		22	.364		16.65	22		38.65	52
4140 10" x 10"		20	.400		19.95	24.50		44.45	59
4220 14" x 14"		16	.500		50.50	30.50		81	102
4240 14" x 20"	▼	15	.533	▼	46.50	32.50		79	101
4980 Air return									
5000 Ceiling or wall, fixed 45° face blades									
5010 Adjustable O.B. damper, anodized aluminum									
5020 4" x 8"	1 Shee	26	.308	Ea.	19	18.75		37.75	49.50
5060 6" x 10"		19	.421		24.50	25.50		50	66
5280 24" x 24"		11	.727		117	44.50		161.50	196
5300 24" x 36"	▼	8	1	▼	186	61		247	297
6000 For steel construction instead of aluminum, deduct					10%				

23 37 15 – Louvers

23 37 15.40 HVAC Louvers

0010 **HVAC LOUVERS**									
0100 Aluminum, extruded, with screen, mill finish									
1002 Brick vent, see also Section 04 05 23.19									
1100 Standard, 4" deep, 8" wide, 5" high	1 Shee	24	.333	Ea.	37	20.50		57.50	71.50
1200 Modular, 4" deep, 7-3/4" wide, 5" high		24	.333		38	20.50		58.50	72.50
1300 Speed brick, 4" deep, 11-5/8" wide, 3-7/8" high		24	.333		38	20.50		58.50	72.50
1400 Fuel oil brick, 4" deep, 8" wide, 5" high		24	.333	▼	65.50	20.50		86	103
2000 Cooling tower and mechanical equip., screens, light weight		40	.200	S.F.	16.30	12.20		28.50	36.50
2020 Standard weight		35	.229		43.50	13.95		57.45	68.50
2500 Dual combination, automatic, intake or exhaust		20	.400		59.50	24.50		84	102
2520 Manual operation		20	.400		44	24.50		68.50	85.50
2540 Electric or pneumatic operation		20	.400	▼	44	24.50		68.50	85.50
2560 Motor, for electric or pneumatic	▼	14	.571	Ea.	510	35		545	615
3000 Fixed blade, continuous line									
3100 Mullion type, stormproof	1 Shee	28	.286	S.F.	44	17.40		61.40	75
3200 Stormproof		28	.286		44	17.40		61.40	75
3300 Vertical line	▼	28	.286	▼	52	17.40		69.40	84
3500 For damper to use with above, add					50%	30%			
3520 Motor, for damper, electric or pneumatic	1 Shee	14	.571	Ea.	510	35		545	615
4000 Operating, 45°, manual, electric or pneumatic		24	.333	S.F.	55.50	20.50		76	92
4100 Motor, for electric or pneumatic		14	.571	Ea.	510	35		545	615
4200 Penthouse, roof		56	.143	S.F.	26	8.70		34.70	41.50
4300 Walls		40	.200		61.50	12.20		73.70	86
5000 Thinline, under 4" thick, fixed blade	▼	40	.200	▼	25.50	12.20		37.70	46.50
5010 Finishes, applied by mfr. at additional cost, available in colors									
5020 Prime coat only, add				S.F.	3.50			3.50	3.85

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